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LIFE HISTORY OF *ETHMIA MACELHOSIELLA* BUSCK. (LEP.)

BY AUGUST BUSCK AND CARL HEINRICH.

Ethmia macelhosiella was described in 1907 (Proc. Ent. Soc. Wash., vol. 8, p. 93) from a single male specimen collected late in September, 1904, near St. Louis, Mo., by Mr. H. A. McElhose. The species was considered rare and remained unknown except for this unique type in the National Museum until the fall of 1916. On November 8, 1916, Mr. E. A. Schwarz brought from Plummers Island, Maryland, a vial containing half a dozen moths with the remark: "What is that common thing? There are a hundred thousand millions of them on the island." The moths were our rare *Ethmia*. The authors went the same day to the island and found the striking black and white moth abundant everywhere on the tree trunks as reported. Plummers Island had probably been explored entomologically more than any other American locality and the reason of our missing this conspicuous species during all these years is partly explained by the fact that it is not equally abundant every year, but more so by the unusually late appearance of the moths, at a season when the collecting of Lepidoptera is normally abandoned. There was no clue to be discovered at that time of the year as to its food plant and it was not before early last spring that we gained further knowledge of the species.

On May 5th last year (1920) Mr. Herbert Barber brought in a small, prettily striped caterpillar found on a tree trunk at Plummers Island.

An examination of the setal arrangement proved the caterpillar to be an *Ethmia*. The authors immediately accompanied Mr. Barber to the island in search of more material. Such we found quite abundant on or near tree trunks. Apparently the caterpillars were full grown and in search of suitable quarters for pupation. Diligent search of the plants growing in the immediate neighborhood was for a long time without result and about to be abandoned when Barber discovered one of the larvae on the leaf of a *Phacelia*. Renewed search on this plant on a lower and more shaded, undisturbed part of the island soon resulted in additional specimens. The brightly striped larvae are quite conspicuous and feed exposed in full

view, but drop to the ground when disturbed and are easily lost sight of. They were all full grown at this date and on the point of leaving their foodplant. A search for the larvae a week or even a day later would have been futile. When full-grown the larva wanders from the foodplant in search of a suitable log or tree trunk in which to pupate. There they sometimes find accidental holes or cracks to satisfy them, but much more often they bore into the sound bark, chewing their way with the mandibles and leaving the chips behind as tell-tale evidence of their presence, an evidence quickly effaced by rain or wind. About a quarter of an inch or more from the surface the larva makes a snug chamber, lining it with silk. Here it pupates a few days later, remaining as pupa all through the summer and fall.

Many larva were taken home for rearing and they were observed boring their way laboriously into solid bark of Cork Elm taken along for the purpose. Others were given the ingenious, ready made pupation blocks covered with isinglass, invented and employed by the economic workers of the Bureau of Entomology in Dr. Quaintance's Division. The *Ethmia* larva at once adopted these, thus saving themselves the hard work of boring their own holes. They merely lined and closed the small chambers with silk, pupating head outwards to enable successful issue of the adult.

On a sunny day late in October or early in November the adults appear and copulate on the tree trunks, flying rather sluggishly when disturbed. An effort was made to keep moths over winter under various conditions, but it was unsuccessful. All of them died within a few weeks without laying eggs. It is probable that in nature the moths live over winter, at least the females, and that they deposit their eggs on the foodplant in the spring. The foodplant has only a very short season in April and early May. Then it disappears and there is no evidence of it above ground. If the eggs of *macelthosiella* are laid on the foodplant, which is the most reasonable supposition, then the adult female must hibernate until early spring. But the possibility that the eggs may be laid in the fall on the ground or on the tree trunk and that the young larvae go in search of their foodplant when it appears in the spring is not excluded by our present observation.

However this may be, the active life of this insect is confined to a very short larval period in early spring and to an adult period of a few days in early winter during which copulation takes place. Through the entire summer it remains inactive as pupa within the bark and during the winter it hibernates inactively as adult (or possibly as egg). The eggs were not obtained and it is not definitely known where and how they are deposited. Dissection of the abdomen of several fertilized

females disclosed only some 20 to 40 rather large eggs in each female, but it is possible that additional eggs may be formed before egg-laying begins.

A technical description of the known stages follows:

Larva.—(Plates 1, 2, Figs. 1, 2, 3, 4, 10) full grown 18–20 mm. long by 2–2.5 mm. wide. Ventral and ventro-lateral surface of body pale smoky grey white; lateral area white, more or less suffused with pinkish and with occasional slight suffusion of yellow, the white area extending in a continuous, clearly defined, longitudinal band the length of the body and including the areas of the spiracle, thoracic setae III, IV and V and abdominal setae IV and V; above the spiracle a broad subdorsal longitudinal band of smoky black including all the setal areas above the spiracles; along mid dorsum a rather narrow, sharply defined longitudinal yellowish white strip faintly suffused with pink and dividing both the thoracic and anal shields; chitinized areas about tubercles large, round or oval, deep dull black; legs strongly chitinized with chitinized areas shiny jet black; crochets of prolegs black, 26 to 30; chitinized attachment of proleg muscles in prolegs black, conspicuous; thoracic and anal shields deep, dull black; body setae moderately long, black; setae group VII on 9th abdominal segment consisting of a cluster of several minute hairs; spiracles small, round, with chitinized rim black. Head and chitinized areas of trophi shining jet black; an irregular transverse white band extending across the top of the head and including in its area setae A2, A3 and Adf1; ocellar lenses whitish.

The presence of secondary hairs on some part of the body coupled with the normal micro arrangement of three setae (III, IV and V) on the prespiracular shield of prothorax and of the close approximation of setae IV and V under the spiracle on the pro-leg bearing abdominal segments appears to be characteristic of the family *Ethmiidae*. In *E. macelhosiella* the secondary hairs are limited to a small cluster in group VII on the 9th abdominal segment.

Pupa.—(Plate 2, Figs. 7, 8, 9) 9.5 mm. long by 3 mm. wide at widest part; dark brown, rather stout; somewhat flattened; abdomen laterally swollen between abdominal segments 4 and 6, widest at abdominal segment 5. Without spines or hairs of any kind, entire surface however finely and irregularly corrugated (see Fig. 7a). Cephalic end rounded; vertex distinct, rather narrow; labrum prominent; labial palpi very small; mandibles rather large; maxillary palpi not reaching proximo-lateral angles of maxillae; maxillae less than half the length of the wing cases; prothoracic and mesothoracic legs half the length of the wing cases; antennae reaching to tips of wings; no femora exposed; wings extending to anterior margin of fifth abdominal segment; spiracles minute, round, not produced; caudal end of abdomen bluntly rounded, bent under and appressed for last three segments; sutures between abdominal segments 5–6 and 6–7 wide and deep; segments 8, 9, 10 narrow; abdominal 10 entirely ventral and flatly appressed. *Anal prolegs (apl) with their crochets present*; anal and genital openings slit-like, the latter lying between the prolegs; cremaster absent.

The most striking and characteristic features of the pupae in this family are: the retention of anal prolegs from the larval stage; the even flattening of the entire pupa and the laterally swollen abdomen with its bent under appressed terminal segments.

Moth.—(Plates 1, 2, 3, Figs. 5, 6, 11, 12, 13, 14, 15). Male antennae blackish brown very indistinctly annulated with white and with undersides of first joint white; second joint of labial palpi black with white base; terminal joint white with a few black scales. Face white with black edges towards the eyes. Head white with a small central black dot on vertex. Thorax white with a central longitudinal, black line and two small posterior black dots. Patagia white with black base. Forewings white with a slight roseate tinge and sparsely sprinkled with black scales; from base to just below apex a conspicuous black longitudinal streak, partly interrupted at the end of the cell by a round pure white dot, the black streak narrowly edged below and partially above by a thin more or less interrupted line of bright orange scales; the black scales in the upper part of the wing tend to form longitudinal streaks; a row of ill-defined black dots before the cilia along the terminal edge. Cilia white. Hindwings light fuscous. Abdomen dark fuscous, each joint tipped with white and anal tuft yellowish white. Venation typical of the genus.

The females are considerably smaller than the males and much darker (Comp. figs. 5 & 6), the forewings more sprinkled with black scaling and the central longitudinal line broader than in the males; hindwings blackish fuscous with light fuscous cilia. Male genitalia (Pls. 2, 3, Figs. 11, 12, 13, 14) with uncus broad, hood-shaped, slightly bilobed; soci absent; gnathos a large, strongly chitinized bulging central plate, heavily spined at apex; vinculum simple; annellus large, semi-cylindrical, fused with transtilla and partly fused with harpes, with two large flaring lobes; aedoeagus large with stout, strongly curved "blind sack" below the entrance hole of the penis, mouth bilobed; cornuti consisting of two long slender spines; harpes broadly fused at base with anellus and a broad undifferentiated transtilla; costa separated by distinct sutures from the rest of the harpes; sacculus large, apex sharply pointed, cucullus armed with a few long costal spines.

The female genitalia with strongly chitinized dorsal and genital plates; ductus bursae with a spiraled, strongly chitinized median part; bursae copulatrix large, oval, with oblong triangular spined *signum* (Plate 3, Fig. 15).

Alas expanse males: 26–28mm.

females: 22–24mm.

The male genitalia are typical of the largest group of *Ethmia* to which *macel-hosiella* belongs (*discostrigella* Chambers, *geranella* Busck, *umbrimarginella* Busck, *semitenebrella* Dyar, etc.) but are at once differentiated by the acutely pointed apex of the harpes.

TERMS USED IN FIGURES HEAD OF LARVA (Figs. 1–2).

- A1, A2, A3 anterior group of setae.
 Aa anterior puncture.
 A D F R adfrontal ridge of frons.

A D F S	adfrontal suture.
E1, E2	epistomal setae.
F1	frontal setae.
Fa	frontal puncture.
Fr	frons.
G1	genal seta.
L1	lateral seta.
LR	longitudinal ridge of frons.
O1, O2, O3	ocellar setae.
Oa	ocellar puncture.
P1, P2	posterior setae.
SO1, SO2, SO3	subocellar setae.
SOa	subocellar puncture.
X	ultra posterior setae and punctures.

TERMS USED IN SETAE MAP OF LARVA (Fig. 3).

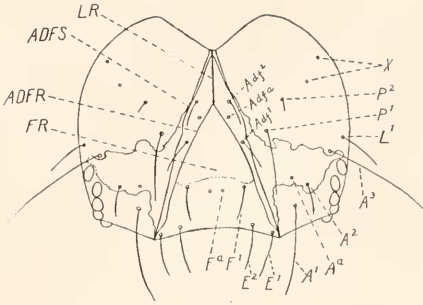
TI, TII	first and second thoracic segment.
AIII, AVIII, AIX	third, eighth and ninth abdominal segments

TERMS USED IN FIGURES OF PUPA (Fig. 7-8).

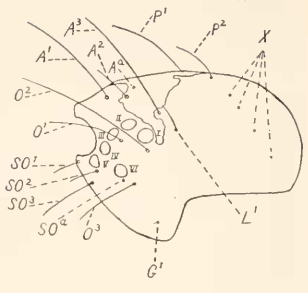
a	antenna.
ao	anal opening.
ge	glazed eye.
go	genital opening.
l1	prothoracic leg.
l2	mesothoracic leg.
lb	labrum
lp	labial palpi
md	mandible.
mp	maxillary palpi.
ms	mesothorax.
mt	metathorax.
mx	maxilla.
se	sculptured eyepiece.
v	vertex.
w	wing.

TERMS USED IN FIGURES OF GENITALIA (Figs. 11, 12, 13, 14).

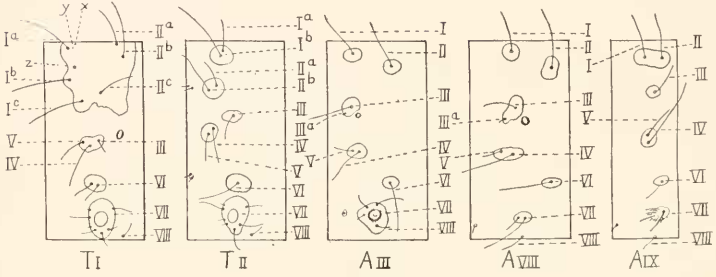
Ae	aedoeagus.
An	anellus.
Cn	cornuti.
Gn	gnathos.
Hp	harpes.
Tg	tegumen.
Ts	transtilla.
U	uncus.
Vm	vinculum.



1



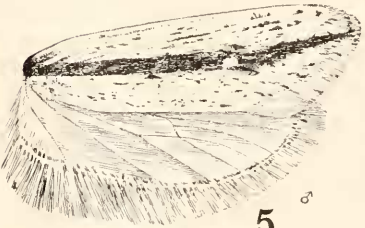
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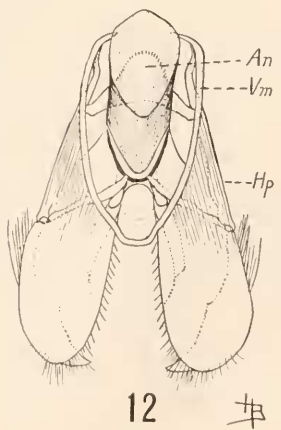
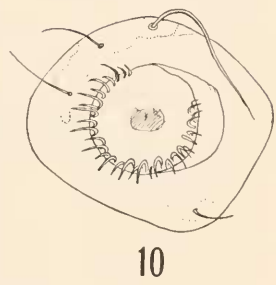
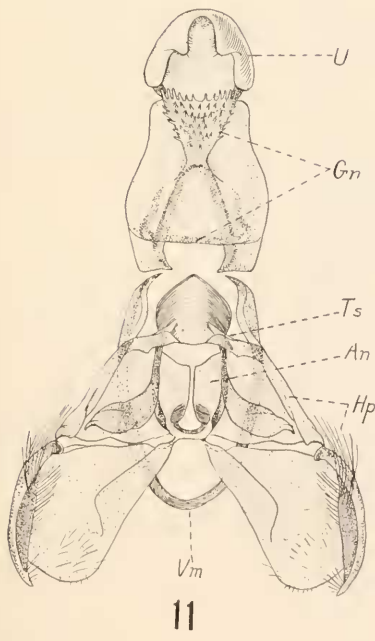
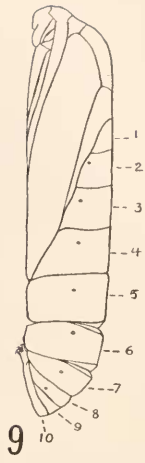
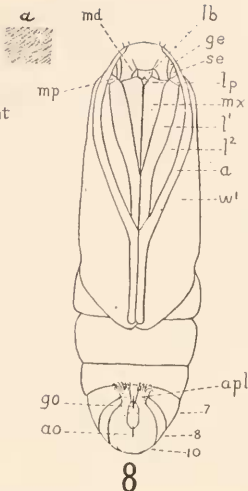
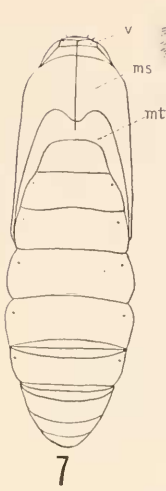
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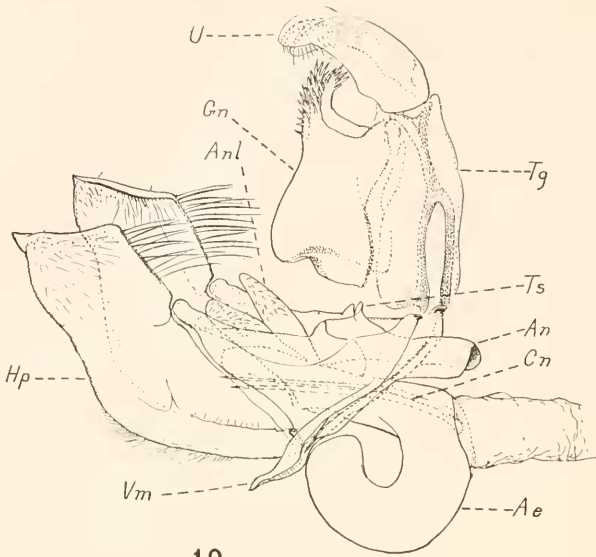


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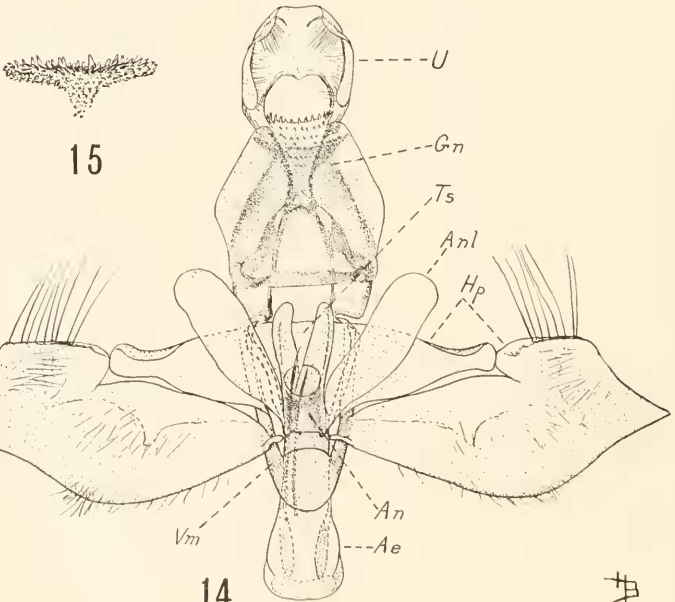


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EXPLANATION OF PLATES.

The drawings were made by Mr. Harry B. Bradford under the direction of the authors.

Plate 1.

- Fig. 1. Head capsule of larva, front view.
 " 2. Head capsule of larva, side view.
 " 3. Setal map of body segments of larva.
 " 4. Larva.
 " 5. Wings of male.
 " 6. Forewing of female.

Plate 2.

- Fig. 7. Pupa, dorsal view.
 " 7a. Section of pupa skin, showing sculpture.
 " 8. Pupa, ventral view.
 " 9. Pupa, side view.
 " 10. Abdominal proleg of larva.
 " 11. Male genitalia of moth, front view; aedoeagus removed.
 " 12. Male genitalia of moth, back view; aedoeagus removed.

Plate 3.

- Fig. 13. Male genitalia, side view.
 " 14. Male genitalia, front view.
 " 15. Signum of female bursa copulatrix.

**THE LARVA OF THE NORTH AMERICAN BEETLE ZENODOSUS
 SANGUINEUS SAY OF THE FAMILY CLERIDAE.**

BY ADAM G. BÖVING AND A. B. CHAMPLAIN.

The description of the following form adds another genus to those previously described by us.¹

***Zenodosus sanguineus* Say.**

(= *Thaneroclerus sanguineus* Say.)

(Plate 4, figs. 1-11.)

U. S. Nat. Mus., Wash., D. C.; four specimens of which one specimen is dissected and mounted on two slides; labeled: *Zenodosus sanguineus* Say, Harrisburg, Pa. In mines of Ptinids and Calandrids in dead scar on living *Betula*. Larvae collected and adults reared by A. B. Champlain.

Total length of body, about 10 mm.; extreme width, about 2 mm.; extreme thickness almost 2 mm.; anterior width of prothorax about 1½ mm. Head capsule with length to width as 5 : 4. Chitinous parts shiny. Head capsule dark Indian red; mandibles dark brown, almost black; prothoracic shield brown ochre, posteriorly with two slightly darker colored spots, medianly with fine light line, meso- and metathoracic plates, basal plate of cerci and claws sepia brown; other chitinized parts brown ochre to pale brown; membranous parts vermilion red with slightly lighter pattern above heart and muscle attachments;

¹Adam Böving and A. B. Champlain: Larvae of North American beetles of the family Cleridae. Proc. U. S. Nat. Mus., vol. 57, No. 2323, p. 620.